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CASE REPORT

Gabapentin for Postoperative Vomiting in Children Requiring Posterior Fossa Tumor Resection

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Gabapentin is well known for its pain control and antiepileptic effect, but its antiemetic effect is poorly investigated. Here we report on effective gabapentin use for refractory vomiting after craniotomy in two children with medulloblastoma in the fourth ventricle. The two pediatric patients (an 11-year-old girl and a 4-year-old boy) underwent near-total excision of the tumor via craniotomy. Both patients suffered from refractory postoperative nausea and vomiting, treated with multiple traditional antiemetic drugs but without relief. After gabapentin intake, their nausea and vomiting improved from one to two episodes per day to complete resolution of symptoms. This report suggests that gabapentin may be a novel antiemetic therapeutic intervention for patients with refractory nausea and vomiting after craniotomy.

1. Introduction

Postoperative nausea and vomiting are frequently observed in patients who have undergone craniotomy.[1] A midline location of tumor is considered a risk factor for post-operative vomiting in children requiring posterior fossa tumor resection and may be refractory to current anti-emetic agents.[2]

Gabapentin is a structural analogue of the neurotransmitter gamma-aminobutyric acid (GABA). However, unlike GABA, which does not cross the blood–brain barrier, gabapentin penetrates into the central nervous system, and its activity is distinct from GABA-related effects.[3] It is an anticonvulsant that has been approved by the US Food and

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Drug Administration since 1994 as adjunct therapy for partial seizures and postherpetic neuralgia. Gabapentin is also known for reducing hot flashes in menopausal women and in women with breast cancer,[4] while its antiemetic effect has been documented in chemotherapy-induced nausea in breast cancer patients,[5] postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy,[6] and in hyperemesis gravidarum.[7]

The use of gabapentin for treating post-craniotomy vomiting in pediatric patients with posterior fossa tumor has not been reported in the literature to date. Herein is a report of the satisfactory antiemetic effect of gabapentin in two children with medulloblastoma who suffered from refractory nausea and vomiting after craniotomy for tumor excision.

2. Case Report

2.1. Case 1

An 11-year-old girl consulted for vomiting once or twice per week for two months with associated dizziness and headache. Neurological examination revealed significant dysmetria and clumsy tandem gait. Brain magnetic resonance imaging (MRI) revealed a globular mass lesion measuring 4.3 cm × 4.4 cm × 3.8 cm in diameter in the fourth ventricle with obstructive hydrocephalus (Figure 1A and B). Near-total excision of the tumor via craniotomy, along with placement of transient external ventricular drainage, was done in January 2009 and the pathology report confirmed the diagnosis of medulloblastoma. The postoperative image is shown in Figure 1C and D. The tumor stage was T2M0 according to Chang's system. The patient was discharged under stable condition, and radiotherapy (5400 rad in 30 fractions for 6 weeks) was started 1 month after surgery. Chemotherapy was not performed in this patient.

Bursts of vomiting about 10 times per day developed for 3 days, and the patient was admitted for vomiting control. Intravenous metoclopramide and granisetron were initially prescribed, and the vomiting ceased. However, the vomiting recurred shortly after the regimen was shifted to oral metoclopramide. Oral domperidone (10 mg four times a day) was added and appeared to be partially effective. Another episode of unstoppable vomiting occurred again 2 weeks later, about nine times per day, which required readmission. Intravenous

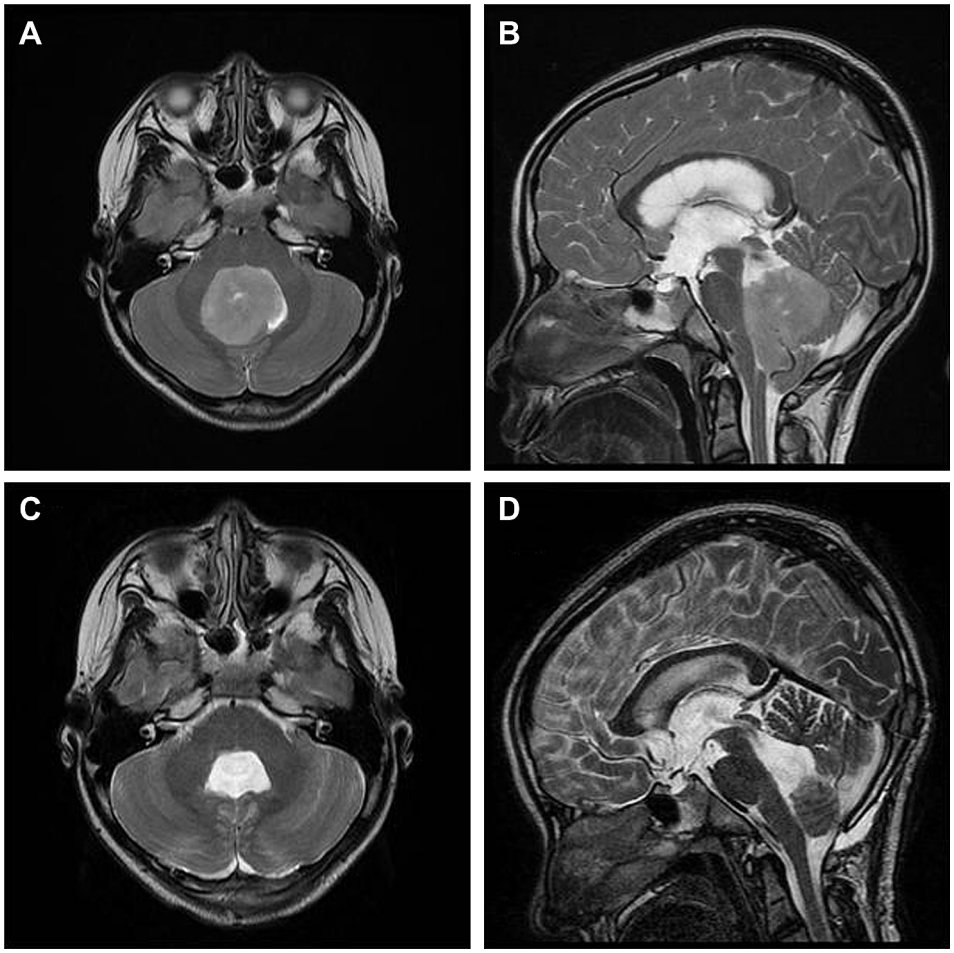

Figure 1 Pre- and postoperative brain magnetic resonance imaging of Case 1. (A and B) The preoperative brain scan shows a globular mass lesion measuring 4.3 cm × 4.4 cm × 3.8 cm in diameter in the fourth ventricle with obstructive hydrocephalus. Medulloblastoma has been documented by pathology. (C and D) The postoperative image shows near-total excision of the tumor and resolution of hydrocephalus.

metoclopramide and granisetron were prescribed initially and were then replaced by oral ondansetron (8 mg three times a day).

After discharge, intermittent vomiting of one to three times a week persisted even after the completion of radiotherapy. Follow-up brain MRI 3 months post-surgery showed no evidence of tumor relapse or hydrocephalus. Oral topiramate (25 mg twice daily) was added along with ondansetron, but with minimal benefit. After thorough discussion with the family, gabapentin (oral 300 mg twice daily) was added and the patient's vomiting ceased. Topiramate and ondansetron were gradually tapered without recurrence of vomiting. After more than 1 year since the start of gabapentin, no side effect has been reported.

2.2. Case 2

A four-year-old boy presented to the neurology clinic with ataxic gait and vomiting for 2 months. Brain MRI revealed a 5.4 cm × 4.6 cm × 4.4 cm tumor within the fourth ventricle extending to the left foramen of Luschka with diffusely enlarged lateral and third ventricles resulting in obstructive hydrocephalus (Figure 2A and B). Sub-occipital craniotomy for near-total excision along with the placement of transient external ventricular drainage was performed in May 2009. The postoperative brain MRI scan is shown in Figure 2C. The pathology report confirmed the diagnosis of medulloblastoma. The tumor stage was T3aM0 according to Chang's system.

Chemotherapy was started and intermittent postprandial vomiting occurred daily, even when chemotherapy was not given. Increased intracranial pressure was initially suspected but was excluded by brain computed tomography scan and MRI. Electroencephalography revealed focal cortical dysfunction in the right temporal and bilateral frontal areas. Epileptic vomiting was suspected, so oxcarbazepine was added for 2 months but without relief of symptoms. The regimen was shifted to topiramate 25 mg twice daily (1.388 mg/kg/dose) but also in vain. Gabapentin was then added at a dose of 100 mg twice daily and the vomiting ceased. Gabapentin was gradually tapered off 8 months later without recurrence of vomiting.

3. Discussion

Patients who undergo craniotomy often experience postoperative nausea and vomiting. The estimated frequencies

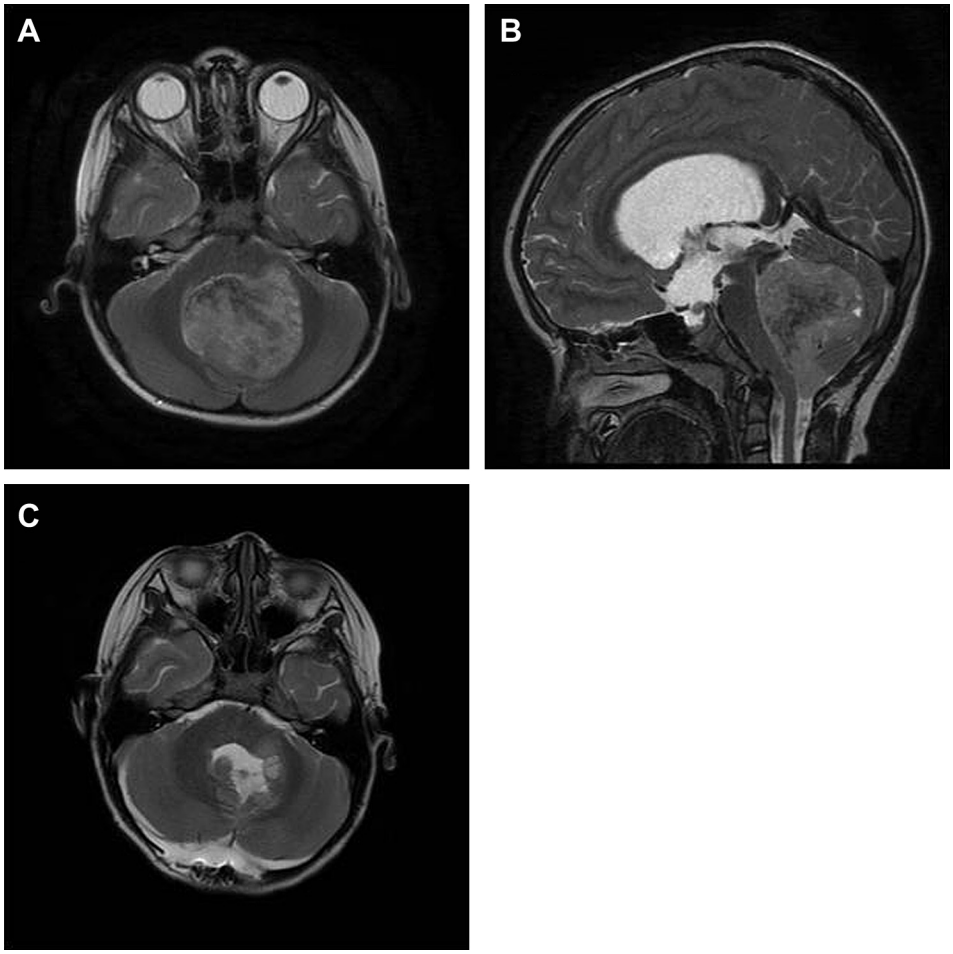

Figure 2 Pre- and postoperative brain magnetic resonance imaging of Case 2. (A and B) The preoperative image reveals a 5.4 cm × 4.6 cm × 4.4 cm tumor within the fourth ventricle extending to the left foramen of Luschka with diffusely enlarged lateral and third ventricles resulting in obstructive hydrocephalus. (C) Medulloblastoma has been documented by pathology. The postoperative image shows near-total excision of the tumor and improvement of hydrocephalus.

of such nausea and vomiting are around 50% and 39%, respectively.[8] According to previous reports, acute post-craniotomy vomiting (emesis during the first 24 hours after an operation) occurs in approximately 50% of patients, but it can be prevented by intravenous ondansetron.[9,10] In chronic postoperative vomiting, management is usually frustrating, with the adverse consequences of dehydration, electrolyte imbalance, hypochloremic metabolic alkalosis, aspiration pneumonia, and failure to thrive in the pediatric population.

Children who require posterior fossa craniotomy appear to be at risk of nausea and vomiting. Posterior fossa takes place below the tentorium. The reticulospinal tracts, diencephalon, limbic system, and discrete areas of cerebral hemispheres may all be involved in nausea, retching, and vomiting. Also, the coordination of autonomic changes associated with retching and vomiting occurs at the level of the medulla oblongata in the posterior fossa. Thus, from an anatomical perspective, surgeries that are proximal to this area may place patients at high risk of vomiting.

There is some evidence that tachykinin activity is part of the pathogenesis of chemotherapy-induced emesis in ferrets,[11] and a selective tachykinin receptor antagonist improved both acute (within 24 hours) and delayed (on days 2—5) chemotherapy-induced nausea and vomiting in humans.[12] It is suggested that mitigating tachykinin neurotransmitter activity is implicated in Gabapentin's mechanism of action in the treatment of hot flashes.[5]

The antiemetic effect of gabapentin has been reported in chemotherapy in patients with breast cancer, hyperemesis gravidarum, and the prevention of postoperative vomiting.[6] There is a case report on the satisfactory effect of gabapentin-scopolamine therapy in an adult patient who underwent posterior fossa cholesteatoma resection and subsequently suffered from severe refractory chronic emesis.[13] From our report, gabapentin may be used in treating post-craniotomy vomiting in pediatric patients with posterior fossa tumor.

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